





News (cont. from p. 97)

- Institute of Technology, 1981 (GAX83-25701). *Investigation of Turbulent Scatter from the Mesosphere as Observed by Coherent Scatter Radar*, Kenneth P. Gibbs, Univ. of Illinois, Urbana-Champaign, 1983 (GAX83-24557). *Mathematical Analysis of Dissipative Curves in High-Temperature Plasmas*, A. New, D. Gorkunov, Univ. of Kentucky, 1983 (GAX83-23208). *Metamorphism and Upper Metamorphism of the Portage Lake Lava Series, Northern Michigan*, Alexander Livan, Univ. of Michigan, 1983 (GAX83-24501). *Microviscosity and the Theory, Measurement and Application of Gravity Gradiometer*, Iwain K. Butler, Texas A&M Univ., 1983 (GAX83-23511). *Paleogeographic Studies in the Northern Appalachians and Their Implications for the Paleozoic History of the Orogen*, Dattu J. Sanyal, Dept. of Geological Sciences, Columbia Univ., November 1983. *Petroleum and Geochronology of Okmok and Wrangell Volcanoes, Alaska*, John Christopher, Univ. of California, Santa Cruz, 1983 (GAX83-23785). *Photoredox Properties of Iron in Natural Waters*, T. David Waite, Dept. of Civil Engineering, MIT, February 1984. *Physiological-Chemical Model to Predict Toxic Risk Fields*, Vira Phonsombut, Texas A&M Univ., 1983 (GAX83-23709). *Relationships of Rock Cleavage Fabrics to Intrusion and Accumulated Strain in a Portion of the Blue Ridge, Virginia*, James B. Tapp, Univ. of Oklahoma, 1983 (GAX83-24895). *Response of a Small Lake to Atmospheric Forcing During Fall Cooling*, Paul T. Stull, Univ. of California, Davis, 1983 (GAX83-26008). *Risk Assessment for Water Quality Management*, Heather D. Wicks, Univ. of Michigan, 1983 (GAX83-24501). *Statistical-Dynamical Study of the Large-Scale Interannual Variability of the Northern Hemisphere Winter Circulation*, Siegfried D. Schubert, Univ. of Wisconsin-Madison, 1983 (GAX83-23939). *Structural and Geochemical Evolution of a Mineralized Volcanic Vent at Cerro de Pico, Peru*, Ralph D. Rogers, Univ. of Arizona, 1983 (GAX83-23747). *Structure of Turbulent Extruding Flow in an Annulus With a Rotating Sleeve*, Sou-Chang Yoon, Oregon State Univ., 1983 (GAX83-20437). *Studies on the Generation, Dispersal and Deposition of Tephra in the Marine and Terrestrial Environment*, Steven N. Carey, Univ. of Rhode Island, 1983 (GAX83-26479). *Theoretical and Empirical Terrestrial Heat Flow Studies (Mexico)*, John P. Ziegler, Southern Methodist Univ., 1983 (GAX83-20672). *Theoretical Studies of Neutronic Eddies and Their Influence on Acoustic Transmission Through the Ocean*, Samuel Iizikowitz, Reissler Polytechnic Institute, 1983 (GAX83-21195). *Thermal Tides in the Atmosphere of Venus*, Judith B. Pechmann, California Institute of Technology, 1983 (GAX83-21031). *Thorium-230-Uranium-238 Disequilibrium Systematics in Young Volcanic Rocks (Hawaii, California, Price Edward Island)*, Sally Newman, Univ. of California, San Diego, 1983 (GAX83-19134). *Three Dimensional Ray-Tracing and Ray-Inversion in Layered Media (1), Inverse Seismic and Curved Ray Tomography With Applications to Seismology (2)*, John A. Fawcett, California Institute of Technology, 1983 (GAX83-25731). *Vacuum Ultraviolet Photogrammetry of Water and Nitrogen Dioxide: Laboratory Studies and Atmospheric Applications*, Jan-Bai Nee, Univ. of Michigan, 1983 (GAX83-24253). *Wave Propagation in Porous Rock and Models for Crustal Structure*, Terry D. Jones, Stanford Univ., 1983 (GAX83-20729).

# Books

## Mineral Deposits and Global Tectonic Settings

A. H. F. Mitchell and M. S. Garson, Academic, New York, xvii + 408 pp., 1981, \$48.50.

Reviewed by Robin Brett

"The earth does not conceal metals in her depths because the does not wish that men should dig them out, but because provident and generous Nature has appointed for each thing its place." Agricola (*De Re Metallica*, 1556, translated by H. C. Hoover and L. H. Hoover, London, Mining Magazine, 1912).

This book aims to show how ore deposits are related to the concept of plate tectonics. It succeeds. Not too long ago, opaque minerals in a thin section were called "vein" by petrologists and then ignored, and ore deposits were freaks of nature which tended to be where you found them. Today, "ore" and ore deposits have become part of mainstream geologic studies—opaque minerals can reveal much about the evolution of a rock, and mineral deposits can reveal tectonic settings.

The main value of this book to most AGU members is that it shows how ore deposits can reveal tectonic setting, unambiguously in many cases, to be sure, but a pattern is emerging. Mitchell and Garson do not stress the flip side, the application of plate tectonics to exploration, although applications are apparent, and a short chapter is devoted to this aspect.

The authors emphasize that ores are rocks that are part of a stratigraphic or igneous sequence and that, just as andesites are anticipated in some tectonic settings and not in others, so are certain types of ore deposits. Mitchell and Garson, whose publications indicate that they are equally at home in the areas of tectonics and mineral deposits, discuss the plan of the book in their preface:

In the first chapter we discuss briefly why tectonic settings are a major control on the nature of the minerals deposited in economic concentrations, and review the pre-plate concepts of the relationship of mineralization to geotectonic settings. We then introduce the plate tectonic hypothesis, and indicate the major developments in ideas on the relationship of mineral deposition to plate processes. The next six chapters, comprising the bulk of the book, are

concerned with the brief description of each of the major types of tectonic settings recognizable today followed by an account of the main kinds of economic deposit found in modern settings and inferred ancient equivalents. We concentrate on aspects of the deposits' genesis related to the regional tectonic setting, and an attempt is made to review features such as temperature of formation or mineralogy which can be found in textbooks concerned exclusively with mineralization and ore bodies.

The authors divide tectonic settings into six categories; each category is in turn further subdivided into seven groups. The six major categories are (1) hot spots, rifts, and ophiolites; (2) passive continental margins and interior basins; (3) oceanic settings, ridges, basins, transform, and hot spots; (4) subduction-related settings; (5) collision-related settings; and (6) transform faults and lineaments in continental crust.

The authors conclude by tracing the evolution of mineral deposits through an orogenic cycle and then devote a five-page chapter to tectonic settings as a guide to exploration. The book has an abundance of figures reprinted from the literature and 36 pages of references (published by 1981) that are invaluable, especially because readers interested in plate tectonics are not generally familiar with the literature of ore deposits.

The authors are both ambitious and courageous in attempting to synthesize knowledge of this subject, and their attempt is an unqualified success. Summaries of examples of deposits in different tectonic settings are left with many unanswered questions that provoked considerable thought—a sign of a good scientific book. Why are certain elements concentrated in certain settings, and why are apparently similar deposits from different settings really similar? Answers to these and other questions will appear in time and will make ore deposits a more powerful tool for tectonic interpretation.

Mitchell and Garson avoid tectonic interpretation of Archean ore deposits. As tectonic interpretation of ore deposits becomes more sophisticated, Archean ore deposits may become a useful tool for interpretation of Archean tectonism. Therefore this book is especially recommended to students of the Archean.

The authors have kept an open mind; most interpretations from the literature are presented without question. As a result, many readers will question some of the work summarized in many sections of the book. The authors' philosophy was clearly to offer completeness rather than to present their own favorite interpretations. An example is their reporting a theory for the origin of fluorite deposits in western North America that alleged that the deposits were formed along a more or less continuous system of rifts and lineaments from Mexico to Alaska by fluorine from the lower crust or upper mantle. Other theories are also presented without question, yet the authors do question the widely accepted impact origin of Sudbury, Ontario.

You may not find your favorite ore deposit mentioned because of space limitations, but Mitchell and Garson did a fine job with the space available. Southeast Asian deposits receive special attention because of the authors' own experience, so the book has the additional advantage of providing an entry to the literature of these deposits not well known to Western Hemisphere readers.

Traditionally, scientific reviewers comment on typographical errors to prove that they read the book thoroughly. I found none, one reference out of place was the only mistake I could find.

I recommend this well-written book to students of both plate tectonics and ore deposits.

Although it is expensive, undergraduates and researchers alike will benefit from it.

Already the book is a little out of date. For example, since it was written, reports have appeared on the Guyanas Basin sulfides and the recent Kuroko study, both with their important tectonic implications. That is not the authors' fault, but rather the sign of a burgeoning field.

Robin Brett is with the U.S. Geological Survey, Reston, VA 22092.

## AGU New Books

### Plate Reconstruction From Paleozoic Paleomagnetism

*Paleomagnetism Series*, vol. 12, edited by R. Van der Voo, C. R. Scotese, and N. Bonhommet, AGU, Washington, D.C., viii + 136 pp., black-and-white illustrations, 1984, ISBN 0-87590-512-9, AGU members \$14, others \$20.

The decade of the 1970's saw increasing global evidence leading to the reconstruction of the continents and oceanic plates through time, fostered by the Geodynamics Project. Aspects of this project are being continued under the auspices of the International Lithosphere Program; in particular, Working Group 2 of the program (Paleozoic plate motions and orogenesis) is active in the investigation of past continental distributions and the plate tectonic products of continental collisions. Paleomagnetic techniques are especially useful for the determination of continental reconstructions, and this volume presents a number of papers dealing with syntheses and new interpretations of previous results as well as new results for Paleozoic time.

The editors believe that the contents of this volume represent a state-of-the-art account of Paleozoic paleomagnetic studies as they are being carried out today. In this collection of papers the paleomagnetic successes and failures of modern paleomagnetic research are represented in accounts of remagnetizations or the lack thereof, as well as some examples where the evidence is not yet clear. All authors have emphasized the geodynamic implications of their results, as well as continental reconstructions based on the latest evidence. Geographical, the papers are representative of the Atlantic-bounding continents, albeit with a heavy emphasis on North American paleomagnetic work.

This volume is based on selected papers presented in a special symposium sponsored by Working Group 2 and the American Geophysical Union and held in Philadelphia during the 1982 Spring Meeting of the American Geophysical Union.

With this first interim report, Working Group 2 is starting a decade of international collaboration aimed at enhancing our knowledge about Paleozoic plate motions, continental configurations, and mountain-building episodes. Future reports are planned on such topics as the structure of the Hercynian and Appalachian mountain belts, the circum-Pacific orogenic belts and the evolution of the Pacific Ocean, and the evolution of the Mediterranean and the Tethys-bounding continents, each based on symposia organized by the Working Group.

(From the preface by R. Van der Voo.)

Contents

Foreword R. A. Price  
Preface R. Van der Voo

# Forum

## Fall Meeting Site

The world is clearly a very troubled place. Many problems contributing to this trouble, such as climatic changes, effects of global warming, geophysical disasters, etc., are the concern and coming under the purview of members of AGU. Within this context, it was clear at the last AGU Fall Meeting that the matter important to most members minds was the large number of parallel sessions.

In light of the overwhelming importance ascribed to this issue, I have devoted considerable thought as to how to solve this overloading. Putting aside for the moment the issue of whether or not the recent Cathedral Hill Hotel was a sign from on high in this matter, I wish to pursue what we, as a Union, can do to solve the problem. Remarkably enough, the Meetings Committee had already apparently perceived the nature of the solution (although dimly) and had stumbled upon a form of my result in a different context. It is perhaps worthwhile for me to review this previous situation prior to presenting my ideas for the West Coast meeting.

The annual Spring Meeting used to have an alarmingly large growth rate, just as the Fall Meeting has now. Everyone seemed to enjoy going to Washington, the meeting typically occupied 4 or 5 of the 10 nice days of weather available each year in the Washington area, and the seafood (herring Red Tide) was rather good. Result: The Spring Meeting grew by leaps and bounds, sessions were overcrowded, time allocations for presentations slanted, and, eventually, the dreaded parallel session became the order of the day.

At this point the many instincts and running intuition that characterize Meetings Committee members' minds came into play. Possibly more by luck than anything else they collectively concluded that the meeting site should be moved. And—behold!—the growth rate of the Spring Meeting became manageable. Without there ever being a clear communication of their underlying principle, the Committee has moved nonetheless even further toward the ultimate solution (and further from the East Coast) by holding the next Spring Meeting in Cincinnati.

What does all this mean? What has this to do with the Fall Meeting? Well, of course, the above facts suggest a solution which has everything. It is simple, elegant, draconian. People like San Francisco as a meeting place, so my proposal is: Let us move the meeting site. For the more final and take-it-easy among us I might suggest that the Meetings Committee consider what I like to call "Baltimore West," i.e., Bakersfield. (My recommendation of this site has nothing—I repeat, nothing—to do with my name being similar to that of the city's founder.) If the Meetings Committee really wants to live the belief on this thing then I suggest that the West Coast Meeting be moved immediately to Bakersfield or, my favorite, Needles. I can assure you that by following this plan, the problem of parallel sessions will be reduced rapidly to a point of zero measure.

H. N. Baker  
Los Alamos National Laboratory  
Los Alamos, NM 87545

An Introduction to This Volume: Paleozoic Paleomagnetism and the Assembly of Pangaea C. R. Scotese

A Paleomagnetic Reevaluation of Pangaea Reconstructions R. Van der Voo, J. Peinado, and C. R. Scotese

The Tethys Paradox in Plate Tectonics J. Stocklin

On the Tectonic Evolution of Mexico: Paleomagnetic Constraints J. Urrutia-Fucugauchi

Paleomagnetism of the Middle Mississippian Greenbrier Group in West Virginia, USA D.-S. L. Chen and V. A. Schmidt

Paleomagnetic Results From the Carboniferous of Nova Scotia C. R. Scotese, R. Van der Voo, R. E. Johnson, and P. S. Giles

Late Paleozoic Motions of the Meguma Terrane, Nova Scotia: Paleomagnetic Evidence D. J. Sparrow, D. V. Kent, and J. D. Kippie

Paleomagnetism of Lower-Middle Devonian and Upper Proterozoic-Cambrian(?) Rocks From Mojavia (Mauritania, West Africa) D. V. Kent, O. Din, and J. M. A. Song

Mid-Ordovician Paleomagnetism and the Proto-Atlantic Ocean in Ireland E. R. Deutsch

Paleomagnetism of the Cambrian Rocks of the Great Valley of East Central Pennsylvania: Fold Test Constraints on the Age of Magnetization R. J. Stein and K. P. Kodung

Was Laurentia Part of an Ecumbric Supercontinent? R. Van der Voo, G. McCabe, and C. R. Scotese

# Classified

## Announcement

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## POSITIONS AVAILABLE

University of Arizona/Research Associate. Applications are invited for two possible positions as research associate in theoretical plasma astrophysics, solar physics and/or cosmic-ray astrophysics.

The successful applicant for the first of the positions will be expected to devote a substantial part of his or her research to problems in solar or interplanetary physics. This position can be filled as early as Spring 1984 and applications should be received by April 30.

The second position involves research on cosmic rays and their interactions in the solar wind or elsewhere. This position can be filled in Fall 1984, and applications should be received by July 31, 1984. Applicants for either position should possess a Ph.D. in a relevant area of physics, astronomy, or planetary sciences.

Inquiries and applications should be addressed to Professor J. R. Jokipii or Professor E. H. Levy, Department of Planetary Sciences, University of Arizona, Tucson, AZ 85721.

Applicants should send a resume, complete bibliography, and arrange for at least three letters of recommendation from persons who are well acquainted with the applicant's background and potential in research.

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# EOS

Transactions, American Geophysical Union

The Weekly Newspaper of Geophysics

For speedier treatment of contributions send three copies of the double-spaced manuscript to one of the editors named below and one copy to AGU.

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Cover. Suggested continent positions in Ecumbric (Yendian-Tommoan) and Late Carboniferous (Westphalian-Sieffian) depicting the assembly of Pangaea by the end of the Paleozoic. Shown are figures 1 and 9 from C. R. Scotese's introduction to *Plate Reconstruction From Paleozoic Paleomagnetism*, edited by R. Van der Voo, C. R. Scotese, and N. Bonhommet, the latest volume in AGU's *Geodynamics Series*, described on p. 98, and 103.

University of Kentucky. The Department of Geology invites applications for two research faculty positions. Areas of specialization are: 1) Geophysics, 2) Mineral or Tectonic geology with some emphasis on geochronology, geophysics, geomorphology, or petrology. It is anticipated that both positions will be filled at the level of Assistant Professor. Letters of application for a more senior position will be considered. Degree of Ph.D. is required.

The Department awards B.S., M.S., and Ph.D. degrees. The starting rank and salary depends on qualifications and experience—either industrial or academic. Letters of application should include a full resume, a statement of intent regarding research, names of three referees, and should be addressed to Dr. Nicholas Ratt, Chairman of Search Committee, Bowman Hall, Room 275, University of Kentucky, Lexington, KY 40506-0028, 1980-257-2222. DEADLINE for application is APRIL 15, 1984. The University of Kentucky is an affirmative action and equal opportunity institution.

Research Position in Space Plasma and Auroral Physics. Two research positions at the level of assistant or associate research scientist are available in the Department of Physics and Astronomy at the University of Iowa for qualified candidates with a Ph.D. degree and experience in space plasmas and/or auroral physics. Present research in space plasma physics emphasizes analysis and interpretation of observations of magnetospheric plasmas using instrumentation on board earth-orbiting spacecraft in the IMF and ISEE Missions. The University of Iowa's global imaging instrumentation on the spacecraft Dynamic Explorer I is the source of an extensive data base of auroral images from high altitudes at visible and ultraviolet wavelengths. Photometric observations are also available for other areas of research including the physics of the upper atmosphere and the global distribution of atmospheric ozone. The applicant should identify and describe areas of his or her expertise which can support experimental or theoretical investigations in space plasma physics and/or auroral physics. Salary and position will be determined by the applicant's qualifications and experience.

Successful candidates will be named by the University of Iowa. A. Frank, Department of Physics & Astronomy, University of Iowa, Van Allen Hall, Iowa City, Iowa 52242.

The University of Iowa is an affirmative action/ equal opportunity employer.

Ocean Turbulence/Oregon State University. Join us in studying turbulence in equatorial waters. A postdoctoral position is available at Oregon State University in a project entitled "Turbulent Transport in TRIPPI: HEAT". The successful applicant will assume a major portion of the responsibility for development of a numerical model of turbulent transport in the Tropics. HEAT is a 100,000 ft cruise in November 1984 and then will share responsibility for scientific analysis of the data obtained. The salary is \$20,000. I will be available for interviews. Applications must be received by 31 March 1984 to:

Douglas R. Caldwell  
College of Oceanography  
Oregon State University  
Corvallis, OR 97331

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Air Force Geophysics Laboratory/Geophysics Scholar Program 1984-1985. The Air Force Geophysics Laboratory (AFGL) and The Southern Research Center for Electrical Engineering Education (SCEEE) announce that applications are invited for research appointments during the 1984-1985 year in the Geophysics Scholar Program. This program provides research opportunities of 10 to 12 months duration for selected Engineers and Scientists to perform research in residence at the AFGL, Hanscom AFB, near Boston, Massachusetts. Scholars will be selected primarily from such fields as Geophysics, Atmospheric Physics, Meteorology, Ionospheric Physics, Applied Science, Mathematical Modeling using Computers, and Engineering.

To be eligible, candidates must have a Ph.D. or equivalent experience in an appropriate technical field. Some appointments may be confirmed prior to August 1984 so early applications are encouraged. All qualified applicants will receive consideration without regard to race, color, religion, sex, or national origin. Application Deadline for September Appointments: August 1, 1984. For further information and application forms contact SCEEE, 1101 Massachusetts Avenue, St. Cloud, FL 32789. Telephone: (305) 892-6146.

SCEEE supports Equal Opportunity/Affirmative Action.

Marine Geology and Geophysics/University of Washington. The School of Oceanography is seeking candidates for a position as Research Assistant Professor, but applications at a more senior level will be considered. Preference will be given to a candidate who has research interests in marine geology and geophysics and who will interact with our ongoing research projects, especially in the area of ridge-crest processes. Although this position will eventually be funded through self-generated research grants, partial financial support is available for the first two years. Teaching requirements will be limited and at the graduate level. For consideration, send a resume, a brief letter describing research interests, and four letters of reference by 1 May 1984 to:

Professor Brian T. Lewis  
Director  
School of Oceanography, WB-10  
University of Washington  
Seattle, WA 98195

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University of Rochester/Postdoctoral Position in Low Temperature Geochemistry. The Department of Geological Sciences has a postdoctoral position for research on low-temperature, naturally occurring radiolites (Be-10, G1-36, L-126, etc.). The research involves the separation of trace amounts of these elements with emphasis on the measurement of Be-10 in a variety of materials to evaluate its potential as a tracer for fluid movement. Measurements will be carried out on the University's tandem accelerator.

The position is available immediately and is initially for one year with a possible one year extension. Send applications with resume and addresses of three referees to:

Dr. Udo Fehn  
Department of Geological Sciences  
University of Rochester  
Rochester, NY 14607

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## FACULTY POSITION

### Geological Engineering Program Department of Civil and Environmental Engineering Washington State University

The Geological Engineering Program at Washington State University has a tenure-track faculty position at the assistant/associate professor level in the area of geology and/or borehole geophysics. A Ph.D. is required and the ideal candidate will have a background combining both areas.

Geology: A strong background in the geological sciences and a high level of proficiency in numerical modeling is highly desirable. Geophysical exploration background is also desirable.

Geophysics: A strong background in borehole geophysics with interest in geology and evaluation of geotechnical properties of rock is highly desirable.

The successful applicant will teach undergraduate and graduate level courses in geology and/or geophysics and be expected to take over an established research program involving graduate students. Professional registration, or qualifications to obtain such registration, is desirable.

Qualified applicants should send a resume, copies of undergraduate and graduate transcripts, and at least three letters of recommendation to Dr. Surinder K. Bhagat, Chairperson, Department of Civil and Environmental Engineering, Washington State University, Pullman, Washington 99164-2010 by April 7, 1984. Washington State University is an equal opportunity/affirmative action employer.

Staff Opportunity/Geophysical Laboratory/Carnegie Institution of Washington. Private employed, basic research and educational organization seeks outstanding scientist with broad interest in developing the principles of Element Concentration. Applicant's background especially should include experimental experience involving a wide range of pressures and temperatures, theory of mass and heat transport, and field aspects of ore deposits. Familiarity with subsurface research desirable. Creative and innovative qualities essential.

Successful applicant will be appointed Earth Sciences Research Scholar for a period not to exceed three years. After demonstration of leadership and excellence in research, the Scholar will be eligible for a regular staff position. Modest funds are available for technical support of the Scholar's work. Applications now being accepted by the Director, Geophysical Laboratory, 2801 Upton Street, N.W., Washington, D.C. 20008. Submit 3-5 page summary of proposed research program, curriculum vitae, three letters of recommendation from persons who can attest to leadership and potential for research, and completed Application Form obtainable from Executive Secretary. Starting date is after 1 July 1984 and is negotiable.

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Faculty Position in Meteorology. Applications are invited for a tenure-track or tenured faculty position in the Division of Meteorology and Physical Oceanography in the Rosenstiel School of Marine and Atmospheric Science of the University of Miami. The rank and salary will be negotiated dependent upon qualifications. The applicant must hold a Ph.D. in atmospheric science, or closely related field, and have a thorough knowledge of large-scale atmospheric dynamics. We are especially seeking applicants from those interested in climate dynamics, including observational studies of all aspects of the general circulation and its interannual variability, although qualified candidates in other areas are also encouraged to apply. The successful candidate will be free to pursue an active research program with a limited amount of graduate-level teaching. Applicants should submit curriculum vitae and the names of three references to: Dr. Eric J. Pichay, Chairman of Search Committee, Rosenstiel School of Marine and Atmospheric Science, University of Miami, 4600 Rickenbacker Causeway, Miami, Florida 33149.

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## SENIOR SCIENTISTS ATMOSPHERIC SCIENCE METEOROLOGIST

### NASA-Goddard Space Flight Center Laboratory for Atmospheric Sciences Greenbelt, Maryland 20771

NASA/Goddard Space Flight Center, Laboratory for Atmospheric Sciences is now accepting applications for two senior scientist positions to lead scientific research in global weather and climate modeling, predictability studies and related research in the Global Modeling and Simulation Branch. Development and maintenance of collaborative activities with the academic community and other institutions/agencies are also important.

The research program strongly emphasizes use of remotely sensed data in numerical weather prediction, and cooperative efforts with other branches of the Laboratory engaged in atmospheric and climate research. The objectives of research in this branch are to investigate the dynamics of global scale processes including climate and boundary processes on various space and time scales. Activities include theoretical and descriptive studies, modeling and prediction of the atmosphere, data set preparation, future observing system simulation studies, algorithm development and research aimed toward design of new or improved satellite missions. The Branch also has responsibility for leading an "Experimental Climate Forecast Center" recently established under an arrangement with the National Climate Program Office. Providing leadership for this new activity would be a part of the role of one of these two senior positions. There is at present a staff of ten research personnel headed by Dr. Eugenia Kalnay, in addition to a substantial support staff.

These positions will be at the GS-14-15 level with a salary range between \$42,722 and \$63,327, the present salary ceiling.

Interested applicants should send resumes no later than May 30, 1984 to:

Dr. D. Atlas, Chief  
Laboratory for Atmospheric Sciences  
NASA/Goddard Space Flight Center  
Code 910  
Greenbelt, MD 20771.



## DEPUTY EXTERNAL RESEARCH

The U.S. Geological Survey (USGS), Geologic Division, Office of Earthquakes, Volcanoes, and Engineering (OEVE) announces a vacancy for Deputy for External Research to act as a senior staff member and consultant to the Chief, OEVE. In planning of contract and grants programs relating to earthquake hazards reduction research. Duties include managing, reviewing, and coordinating contracts and grants in earthquake research undertaken by OEVE, and maintaining contact with both public and private institutions and agencies conducting related research. Geographic location of this position (Reston, Virginia; Denver, Colorado; Menlo Park, California) is subject to negotiation, depending upon selection's preference and the requirements of management. Position is a GS-15 with initial salary of \$50,252 per annum for new Federal employees. Send Standard form 171 (SF-171), Personal Qualifications Statement, available at any Federal Personnel Office, to:

Geological Survey  
ATTN: Mr. R. W. Mervine  
215 National Center  
Reston, Virginia 22092

A detailed resume of education, experience, and salary history may be substituted if an SF-171 is not available. All applicants must submit copies of college transcripts or a list of courses taken. Applications must be received in the USGS Personnel Office by April 13, 1984.

Equal Opportunity Employer.

**Staff Position/Department of Terrestrial Magnetism.** The Department of Terrestrial Magnetism of the Carnegie Institution of Washington invites applications for a staff position in geomagnetism. Applicants should have a demonstrated ability for original and innovative independent research using modern and/or isotopic techniques to investigate the origin and geomagnetic evolution of the solid earth.

Applicants should send a resume and have three letters of reference forwarded by May 15 to: Geomagnetism Staffing Committee, Department of Terrestrial Magnetism, 5211 Broad Branch Road, N.W., Washington, D.C. 20012.

Starting time for the appointment is flexible through a target date of late 1984 is preferred.

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**Faculty Position/University of Montana.** The Faculty Position of the University of Montana is seeking applications to fill a temporary, research position at the Assistant Professor level (contract period will be from mid-September 1984 to early June 1985). This position involves research in geomagnetism and/or related fields. Ph.D. in geology is preferred, however, M.A. with teaching or professional experience will be considered. Students planning to complete their graduate degree during the 1984-85 academic year are encouraged to apply. Teaching responsibilities include undergraduate courses and introduction to geology, meteorology, petrology, and mineralogy and a seminar in area of special interest.

Those interested should send a letter of application, resume, three letters of recommendation to: Arnold J. Silverman, Chairman, Department of Geology, University of Montana, Missoula, MT 59812. The DEADLINE for applications is May 15, 1984. The University of Montana is an affirmative action/equal opportunity employer.

## POSTDOCTORAL APPOINTMENT IN ANALYTICAL, SEPARATION OR RADIOCHEMISTRY

The Isotope Geochemistry group of the Los Alamos National Laboratory is seeking candidates for a postdoctoral appointment in analytical, separation or radiochemistry.

This opportunity will include participation in a solar neutrino experiment [Science 216, 51 (1982)] with involvement in separation and purification of trace quantities of technetium from large quantities of molybdenum. Experience in wet chemical separation is required.

The Laboratory, one of the nation's foremost scientific research organizations, is operated by the University of California for the U.S. Department of Energy. Our location in the mountains of northern New Mexico offers an unswayed lifestyle with ample recreational activities.

Our postdoctoral appointments are for one year, renewable for a second year and pay a stipend amount of \$26,200 to \$27,600 per annum. We provide employee benefits, including incoming travel and moving expenses. Candidates no more than three years past their Ph.D. are invited to apply. U.S. Citizenship is required.

Send your resume in confidence to: Madeline Lucas, DIV 84-AT, Personnel Services Division, Los Alamos National Laboratory, Los Alamos, New Mexico 87545.

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**Faculty Position or Scripps Institution of Oceanography/Institute of Geophysics and Planetary Physics.** Applications are invited for a tenure track faculty position in the broad field of fluid dynamics which includes, for example, geophysics, both theoretical and observational, numerical modeling of fluids, and the dynamics of the earth's core. This position is the case for all other faculty positions at IGPP, will be made jointly with the teaching department of Scripps or another department at the University of California, San Diego. Qualifications include a Ph.D. in one of the sciences (including engineering), demonstrated competence in original research (presumably through publication in refereed journals), and in teaching at both the undergraduate and graduate levels, with a fluency in English. Qualified applicants at all levels will be considered. Salary will be commensurate with the individual's qualifications. Please send applications and nominations to:

Professor Freeman Gilbert

University of California, San Diego

Institute of Geophysics and Planetary Physics

La Jolla, CA 92093

Responses must be received by April 30, 1984.

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**Research scientist/University of Colorado.** The Laboratory for Atmospheric and Space Physics at the University of Colorado seeks qualified research scientists in the field of atmospheric physics. The successful applicant would conduct research with the scientific team at LASP analyzing more than two years of Solar Mesosphere Explorer (SME) data. The extensive data base includes global measurements of ozone, temperature, water vapor, nitrogen dioxide and other parameters of the Earth's Mesosphere and Stratosphere. A doctorate or its equivalent in a relevant subject is necessary. The person selected must be capable of continuing individual research and working as part of a scientific team. A background in solar, planetary or atmospheric sciences is desirable. Salary commensurate with experience. Applications including a current professional resume and names of three references should be sent to:

Dr. R.J. Thomas

Laboratory for Atmospheric and Space Physics

University of Colorado

Boulder, Colorado 80509

Applications are being accepted on a continuous basis.

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**University of New Mexico/Paleomagnetism.** The Department of Geology of the University of New Mexico invites applications for a tenure track full-time position as an Assistant Professor with a specialty in paleomagnetism beginning Fall 1984. The successful candidate will be expected to maintain an active research program and teach at the undergraduate and graduate level. The Department has six full-time faculty, is located in a spectacular natural setting and has excellent analytical facilities. Applicants should submit a resume, transcripts, and three letters of recommendation to R. Ewing, Department of Geology, Albuquerque, New Mexico 87131. The deadline for applications is April 10, 1984.

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## NATIONAL SCIENCE FOUNDATION

### Assistant/Associate Program Director

NSF's Division of Ocean Sciences is seeking candidates for the position of Assistant/Associate Program Director in the Oceanic Biology Program. The position is expected from the competitive civil service and will be filled by September 1984 on a two year rotational basis.

The per annum salary ranges from \$30,000 to \$45,000 for the Assistant Program Director and \$35,000 to \$55,000 for the Associate Program Director.

The program supports fundamental research into the biology of the oceans. The incumbent will provide technical expertise in proposal evaluation, administration of research grants, program planning and budgeting. Applicants should have a Ph.D. in oceanography or marine biology, or equivalent experience. In addition, for the Assistant Program Director, three to four years of successful scientific research experience beyond the Ph.D. is desirable. Experience in an academic research institution is highly desirable. Applicants should refer to Announcement Number EX 84-28EOS when submitting resumes (including current salary) to:

The National Science Foundation  
Personnel Administration Branch  
Room 212  
1800 G Street, N.W.  
Washington, D.C. 20550  
ATTN: Timothy Connelly

For further information call 202/357-7840. Hearing impaired individuals should call: TDD 202/357-7492.

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1984.

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## POSITIONS WANTED

**Seismologist.** Ph.D. early 1981 seeking research or teaching position. Experience in data reduction, seismicity on morphology, teleseismic modeling, crustal studies of continental deformation, and microearthquake surveys. Initial knowledge of computers including VAX-VMS and LISP. Microcomputer. Box 920, American Geophysical Union, 2000 Florida Avenue, N.W., Washington, D.C. 20009.

## STUDENT OPPORTUNITIES

Research Assistantships/University of Maryland, The Meteorology Department of the University of

Maryland has research assistantships available for graduate students, Fall Semester 1984. The Department of Meteorology and the Center for Environmental and Estuarine Studies are currently accepting applications for students at the University of Maryland. The Center for Environmental and Estuarine Studies is currently accepting applications for students at the University of Maryland. The Center for Environmental and Estuarine Studies is currently accepting applications for students at the University of Maryland.

Interested individuals are encouraged to write for more information to the following address: Chairman, Department of Meteorology, University of Maryland, College Park, MD 20742.

Research Fellowships in the University of Notre Dame. Fellowships in groundwater physics, groundwater chemistry, atmospheric processes and engineering are currently available in the Environmental Engineering Program of the Civil Engineering Department. Successful applicants will be awarded annual stipends of up to \$10,000, plus full tuition. For additional information, contact Mr. Aaron A. Jensen, Department of Civil Engineering, University of Notre Dame, Notre Dame, IN 46556 (219-231-5846).

man, Department of Meteorology, University of Maryland, College Park, MD 20742.

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## AGU

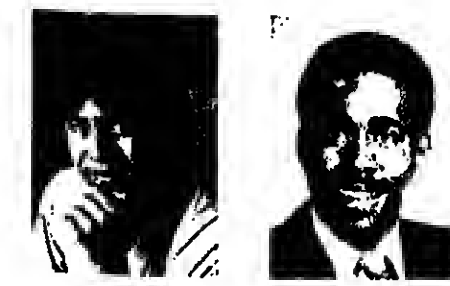
### AGU Scholars

In recognition of the strong support of the American Geophysical Union and its substantial contribution to the American Geological Institute's (AGI) Minority Participation Program, 12 of the 1983-1984 AGI scholarship participants were designated "AGU Scholars." Because part of this support comes from a matching grant from the National Oceanic and Atmospheric Administration to increase the number of minority students studying in fields related to the development of marine and coastal resources, five of these students were designated "AGU Sea Scholars."

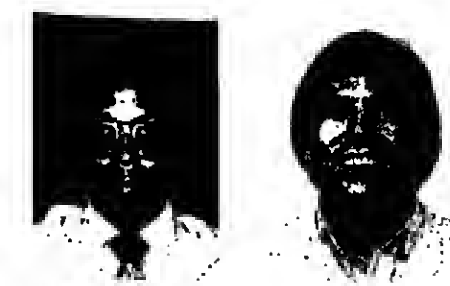
The AGU Scholars, all of whom have elected courses of study related to the broad areas of interest of the Union, are: Rolfus Luchings, a geophysics graduate student at Stanford University; Charles R. Elerson, a graduate geophysics student at Louisiana Technical University; Ronald L. Keas and Orlando M. Marques, undergraduate geophysics students at the Colorado School of Mines; Andrew Lewis Mickle, a hydrology graduate student at the University of Florida; Jaime Rangel, an undergraduate geophysics student at the University of Texas at Austin; and Ronald Wynn Sheers, a graduate geophysics student at Ohio State University.

The AGU Sea Scholars are Aaron Anthony Diaz, an undergraduate oceanography student at Washington State University; Adam Green, a marine sciences undergraduate student at Southampton College of Long Island University; Peter A. Herrera, a geophysics graduate student at the Colorado School of Mines; Michael W. Howell, a marine geophysics student at the University of Michigan; and Dawn J. Wright, an oceanography graduate student at Texas A&M University.

Catchings, Howell, and Wright have been AGU Scholars in prior years.



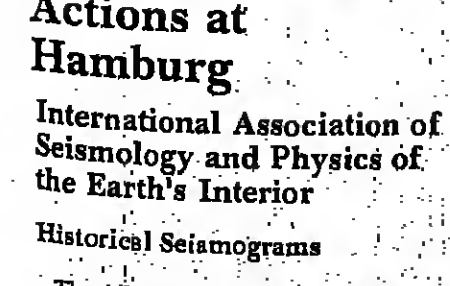
Aaron A. Diaz



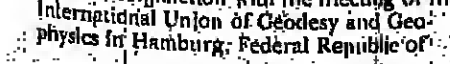
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